Amendments To The Claims

This listing of claims will replace all prior versions and listings of claims in the application:

1-53.   (Canceled).

54. A method of probabilistically classifying a sample of tissue of a mammalian anatomical structure, tissues of which may have various morphological and biochemical states and are classifiable in accordance therewith, comprising:

   illuminating the tissue sample with electromagnetic radiation of a first wavelength selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of a first classification thereof;

   detecting a first fluorescence intensity spectrum from the tissue sample resulting from the first wavelength illuminating step; and

   calculating a first probability that the tissue sample belongs in the first classification from a data set comprising the first fluorescence intensity spectrum.

55. The method of claim 54, wherein the first wavelength is within one of the ranges of 317-357 nm, 360-400 nm and 440-480 nm.

56. The method of claim 54 wherein the first fluorescence intensity spectrum comprises emission wavelengths of about 410 nm, about 460 nm, about 510 nm and about 580 nm when the first wavelength is about 337 nm; about 460 nm, about 510 nm, about 580 nm, about 600 nm and about 640 nm when the first wavelength is about 380 nm; and about 510, about 580 nm, about 600 nm, about 620 nm, about 640 nm and about 660 nm when the first wavelength is about 460 nm.

57. A method as in claim 54, further comprising:

   illuminating the tissue sample with electromagnetic radiation of a second wavelength selected to stimulate in tissues of the mammalian anatomical structure a

fluorescence having spectral characteristics indicative of a second classification thereof;

detecting a second fluorescence intensity spectrum from the tissue sample resulting from the second wavelength illuminating step;

calculating a second probability that the tissue sample belongs in the second classification from a data set comprising the second fluorescence intensity spectrum; and.

classifying the tissue sample in the second classification if the first and second probabilities exceed respective thresholds.

58. A method as in claim 54, further comprising:

illuminating the tissue sample with electromagnetic radiation of a second wavelength selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of a second classification thereof;

detecting a second fluorescence intensity spectrum from the tissue sample resulting from the second wavelength illuminating step;

calculating a second probability that the tissue sample belongs in the second classification from a data set comprising the second fluorescence intensity spectrum;.

illuminating the tissue sample with electromagnetic radiation of a third wavelength selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of a third classification thereof;

detecting a third fluorescence intensity spectrum from the tissue sample resulting from the third wavelength illuminating step;

calculating a third probability that the tissue sample belongs in the third classification from a data set comprising the third fluorescence intensity spectrum; and

classifying the tissue sample in the second classification if the third, first and second probabilities exceed respective thresholds.

59. A method as in claim 58, wherein:

the third classification is SIL as distinguished from normal squamous, and the wavelength selected to stimulate in tissues of the mammalian anatomical structure

a fluorescence having spectral characteristics indicative of the third classification thereof is selected for cervical tissues from 337 nm and 460 nm;

the first classification is SIL as distinguished from normal columnar and inflammation, and the wavelength selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of the first classification thereof is 380 nm for cervical tissues; and

the second classification is high grade SIL as distinguished from low grade SIL, and the wavelength selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of the first classification thereof is 460 nm for cervical tissues.

60. A method as in claim 54 further comprising:

illuminating the tissue sample with electromagnetic radiation of a second wavelength selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of a first classification thereof; and

detecting a second fluorescence intensity spectrum from the tissue sample resulting from the second wavelength illuminating step;

wherein the calculating step comprises calculating the first probability from a data set comprising the first and second fluorescence intensity spectrum.

61. A method as in claim 60 further comprising:

illuminating the tissue sample with electromagnetic radiation of a third wavelength selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of a first classification thereof; and

detecting a third fluorescence intensity spectrum from the tissue sample resulting from the second wavelength illuminating step;

wherein the calculating step comprises calculating the first probability from a data set comprising the first, second and third fluorescence intensity spectrum.

62. A method as in claim 61 wherein the electromagnetic radiation of the first, second and third wavelengths further is selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of a second classification thereof, further comprising calculating a second probability that the tissue sample belongs in the second classification from a data set comprising the first, second and third fluorescence intensity spectrum.

63. A method as in claim 62 wherein the electromagnetic radiation of the first, second and third wavelengths further is selected to stimulate in tissues of the mammalian anatomical structure a fluorescence having spectral characteristics indicative of a third classification thereof, further comprising calculating a third probability that the tissue sample belongs in the third classification from a data set comprising the first, second and third fluorescence intensity spectrum.

64. A method as in claim 63, wherein:

the first wavelength is about 337 nm;

the second wavelength is about 380 nm;

the third wavelength is about 460 nm;

the third classification is SIL as distinguished from normal squamous;

the first classification is SIL as distinguished from normal columnar; and

the second classification is high grade SIL as distinguished from low grade SIL.

65. A method as in claim 54 wherein the calculating step comprises calculating a probability from the first fluorescence intensity spectrum that the tissue is SIL versus normal squamous.

66. A method as in claim 65 wherein the illuminating step comprises illuminating the tissue sample with electromagnetic radiation having a wavelength of about 337 nm.

67. A method as in claim 65 wherein the illuminating step comprises illuminating the tissue sample with electromagnetic radiation having a wavelength of about 460 nm.

68. A method as in claim 54 wherein the calculating step comprises calculating a probability from the first fluorescence intensity spectrum that the tissue is SIL versus normal columnar and inflammation.

69. A method as in claim 68 wherein the illuminating step comprises illuminating the tissue sample with electromagnetic radiation having a wavelength of about 380 nm.

70. A method as in claim 54 wherein the calculating step comprises calculating a probability from the first fluorescence intensity spectrum that the tissue is high grade SIL versus low grade SIL.

71. A method as in claim 70 wherein the illuminating step comprises illuminating the tissue with electromagnetic radiation having a wavelength of about 460 nm.

72. The method of claim 54 wherein the illuminating step is performed *in vivo*.

73. The method of claim 54 wherein the illuminating step is performed *in vitro*.

74. A method of assigning a probability that a tissue sample belongs to a particular tissue category, comprising:
providing a first tissue sample;
illuminating the first tissue sample with electromagnetic radiation having at least one wavelength known to excite tissue into producing a fluorescence intensity spectra containing information about whether tissue belongs to the particular tissue category;
detecting a fluorescence intensity spectra from the first tissue sample; and
calculating from the fluorescence intensity spectra from the first tissue sample a probability that the tissue sample belongs to the particular tissue category.

75. A method as in claim 74 wherein the calculating step comprises:
providing a statistically significant plurality of second tissue samples, at least some of which are tissues known to belong to the particular tissue category;
illuminating the second tissue samples with the electromagnetic radiation;

detecting a plurality of fluorescence intensity spectra from the second tissue samples, respectively;

calculating from the fluorescence intensity spectra from the second tissue samples a probability distribution for the second tissue samples belonging to the particular tissue category; and

calculating the probability that the tissue sample belongs to the particular tissue category using the fluorescence intensity spectra from the first tissue sample and the probability distribution for the second tissue samples.

76. A method as in claim 75 wherein the probability distribution calculating step comprises:

generating a set of first vectors that account for variation in the fluorescence intensity spectra from the second tissue samples; and

selecting from the first vectors a set of second vectors that are indicative of the particular tissue category, the second vectors containing first indicia of the probability distribution for the second tissue samples belonging to the particular tissue category.

77. A method as in claim 76 wherein:

the first vector generating step comprises principle component analysis;

the second vector generating step comprises a student's t-test; and

the step of calculating the probability that the tissue sample belongs to the particular tissue category using the fluorescence intensity spectra from the first tissue sample and the probability distribution for the second tissue samples comprises logistic discrimination.

78. A method as in claim 74 wherein:

the illuminating step comprises illuminating the tissue sample with electromagnetic radiation having at least a first wavelength known to excite tissue into producing a fluorescence intensity spectra containing information about whether tissue belongs to a first tissue category, and a second wavelength known to excite tissue into producing a fluorescence intensity spectra containing information about

whether tissue belongs to a second tissue category that is a refinement of the first tissue category;

the detecting step comprises detecting first and second fluorescence intensity spectra from the illuminating step to obtain respective first and second spectral data; and

the calculating step comprises calculating from the first spectral data a first probability that the tissue sample belongs to the first tissue category, calculating from the second spectral data a second probability that the tissue sample belongs to the first tissue category, and assigning the tissue sample a probability of belonging to the second tissue category from the first and second probabilities.

79. A method as in claim 74 wherein:

the illuminating step comprises illuminating the tissue sample with electromagnetic radiation having a first wavelength of about 337 nm, a second wavelength of about 380 nm, and a third wavelength of about 460 nm; and

the detecting step comprises detecting first, second and third fluorescence intensity spectra from the illuminating step to obtain respective first, second and third spectral data; and

calculating from the first, second and third spectral data a probability that the tissue sample belongs to the particular tissue category.

80. The method of claim 54 wherein the calculating step comprises:

providing a statistically significant plurality of additional tissue samples, at least some of which are tissues known to belong to the first classification;

illuminating the additional tissue samples with the first wavelength electromagnetic radiation;

detecting a plurality of additional fluorescence intensity spectra from the additional tissue samples;

generating vectors that account for variation in the additional fluorescence intensity spectra and that are indicative of the first classification; and

calculating the first probability from the data set comprising the first fluorescence intensity spectrum, with use of the vectors.

81. The method of claim 80 wherein the first fluorescence intensity spectrum comprises emission wavelengths of about 410 nm, about 460 nm, about 510 nm and about 580 nm when the first wavelength is about 337 nm; about 460 nm, about 510 nm, about 580 nm, about 600 nm and about 640 nm when the first wavelength is about 380 nm; and about 510, about 580 nm, about 600 nm, about 620 nm, about 640 nm and about 660 nm when the first wavelength is about 460 nm.

82. The method of claim 57 wherein the first probability calculating step comprises:

providing a statistically significant first plurality of tissue samples, at least some of which are tissues known to belong to the first classification;

illuminating the first plurality of tissue samples with the first wavelength electromagnetic radiation;

detecting a first plurality of fluorescence intensity spectra from the first plurality of tissue samples;

generating first vectors that account for variation in the first plurality of fluorescence intensity spectra and that are indicative of the first classification;

calculating the first probability from the data set comprising the first fluorescence intensity spectrum, with use of the first vectors;

and wherein the second probability calculating step comprises:

providing a statistically significant second plurality of tissue samples, at least some of which are tissues known to belong to the second classification;

illuminating the second plurality of tissue samples with the second wavelength electromagnetic radiation;

detecting a second plurality of fluorescence intensity spectra from the second plurality of tissue samples;

generating second vectors that account for variation in the second plurality of fluorescence intensity spectra and that are indicative of the second classification; and

calculating the second probability from the data set comprising the second fluorescence intensity spectrum, with use of the second vectors.

83.   The method of claim 58 wherein the first probability calculating step comprises:

providing a statistically significant first plurality of tissue samples, at least some of which are tissues known to belong to the first classification;

illuminating the first plurality of tissue samples with the first wavelength electromagnetic radiation;

detecting a first plurality of fluorescence intensity spectra from the first plurality of tissue samples;

generating first vectors that account for variation in the first plurality of fluorescence intensity spectra and that are indicative of the first classification;

calculating the first probability from the data set comprising the first fluorescence intensity spectrum, with use of the first vectors;

wherein the second probability calculating step comprises:

providing a statistically significant second plurality of tissue samples, at least some of which are tissues known to belong to the second classification;

illuminating the second plurality of tissue samples with the second wavelength electromagnetic radiation;

detecting a second plurality of fluorescence intensity spectra from the second plurality of tissue samples;

generating second vectors that account for variation in the second plurality of fluorescence intensity spectra and that are indicative of the second classification; and

calculating the second probability from the data set comprising the second fluorescence intensity spectrum, with use of the second vectors;

and wherein the third probability calculating step comprises:

providing a statistically significant third plurality of tissue samples, at least some of which are tissues known to belong to the third classification;

illuminating the third plurality of tissue samples with the third wavelength electromagnetic radiation;

detecting a third plurality of fluorescence intensity spectra from the third plurality of tissue samples;

generating third vectors that account for variation in the second plurality of fluorescence intensity spectra and that are indicative of the second classification; and

calculating the third probability from the data set comprising the third fluorescence intensity spectrum, with use of the third vectors.

84.   The method of claim 60 wherein the step of calculating the first probability from a data set comprising the first and second fluorescence intensity spectrum comprises:

providing a statistically significant plurality of additional tissue samples, at least some of which are tissues known to belong to the first classification;

illuminating the additional tissue samples with the first wavelength electromagnetic radiation;

detecting a first plurality of fluorescence intensity spectra from the additional tissue samples illuminated in the first wavelength illuminating step;

illuminating the additional tissue samples with the second wavelength electromagnetic radiation;

detecting a second plurality of fluorescence intensity spectra from the additional tissue samples illuminated in the second wavelength illuminating step;

generating vectors that account for variation in the first and second pluralities of fluorescence intensity spectra and that are indicative of the first classification; and

calculating the first probability from the data set comprising the first fluorescence intensity spectrum, with use of the vectors.

85.   The method of claim 61 wherein the step of calculating the first probability from a data set comprising the first, second and third fluorescence intensity spectrum comprises:

providing a statistically significant plurality of additional tissue samples, at least some of which are tissues known to belong to the first classification;

illuminating the additional tissue samples with the first wavelength electromagnetic radiation;

detecting a first plurality of fluorescence intensity spectra from the additional tissue samples illuminated in the first wavelength illuminating step;

illuminating the additional tissue samples with the second wavelength electromagnetic radiation;

detecting a second plurality of fluorescence intensity spectra from the additional tissue samples illuminated in the second wavelength illuminating step;

illuminating the additional tissue samples with the third wavelength electromagnetic radiation;

detecting a third plurality of fluorescence intensity spectra from the additional tissue samples illuminated in the second wavelength illuminating step;

generating vectors that account for variation in the first, second and third pluralities of fluorescence intensity spectra and that are indicative of the first classification; and

calculating the first probability from the data set comprising the first fluorescence intensity spectrum, with use of the vectors.